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# Genetic variability, heritability in narrow sense & Genetic advance percent of mean in bitter gourd (*Momordica charantia* L.)

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**Abstract**
The present investigation was carried out in two years with aims to determine, Genetic variability and heritability in narrow sense involving 9 parental lines *viz*., NDBT-7, NDBT-9, NDBT-3, NDBT-2, Pusa Do Mausmi, NDBT-12, NDBT-1, K. Sona, NDBT-5 of bitter gourd at MES Vegetable Science N.D.U.A. & T. Kumarganj, Faizabad (U.P.) during summer 2011 and 2012. The experiments were laid out in RBD with three replications single row plot with 3 m x 0.5 m spacing. Observations were recorded on 13 characters *viz.* node number to first staminate and pistillate flower anthesis, days to first staminate and pistillate flower opening, days to first fruit harvest, number of primary branches per plant, node number of first fruits set, vine length (m), fruit length (cm), fruit diameter (cm), number of fruits per plant, fruits, fruit weight (g), yield per plant (kg). The analysis of variance due to genotype, parents, hybrids and parents vs. hybrids were found almost highly significant for all the characters, except due to parents vs hybrids for days to first staminate flower opening and node number to first staminate and pistillate flower appearance in both the years during 2011 and 2012. High estimate of genotypic as well as phenotypic coefficients of variability were observed for fruit yield per plant and number of fruit per plant during 2011 and 2012. The phenotypic coefficients of variability were only higher for fruit yield per plant during 2011. Moderate variability showed in fruit yield per plant Rest of characters showed low coefficient of variability.

**Keywords:** variability, heritability, anthesis, bitter gourd

## Introduction
India being the second largest producer of vegetables in the world next to only China, shares about 15 percent of the world output of vegetables and about 3 percent of total cropped area in the country. The current production level is over 110 million tones from an area of 7.2 million hectares. In spite of such a large production, the per capita per day supply of vegetables could not rise above 175 g in the country which is lower than the recommended dietary allowance (RDA) of 350 to 400 g per capita per day for a balanced diet (Rai & Pandey, 2007) [1]. The vegetable requirement of our country is estimated to be 220 million tones by 2020 (Singh, 2004) [2]. This target can best be achieved through use of improved varieties and hybrids in combination with better crop management technology. Substantial increase in productivity appears feasible even diminishing land and water resource. In order to step up the production potential, there is an urgent need to launch a dynamic breeding program to develop high yielding varieties/hybrids suitable for different agro-climate regions. Genetic variability is considered to be essential for initiating an effective breeding program and therefore, it becomes imperative to study the level of genetic variability to work out an efficient selection criterion. The available variability in a population can be partitioned into heritable and non heritable components of genetic parameters such as coefficient of variation, heritability and genetic advance to serve as basis for selection of some outstanding genotypes than existing ones. In the absence of such information, is a way of knowing among several hundred accessions which will most likely provide the particular traits needed in breeding programme. Therefore, more work of this nature is essential, if the enormous wealth of genetic resources now flowing gene banks, is to be evaluated and utilized.

## Materials and Methods
The experimental materials for the present study comprised of nine promising and diverse inbred lines/parents of bitter gourd selected on the basis of genetic variability from the germplasm stock maintained in the Department of Vegetable Science, N.D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) India. The selected parental lines *viz.* NDBT-7 ($P_1$), NDBT-9 ($P_2$), NDBT-3 ($P_3$), NDBT-2 ($P_4$), Pusa Do Mausmani, (standard variety) ($P_5$), NDBT-12 ($P_6$), NDBT-1 ($P_7$), K, Sona ($P_8$) and NDBT-5 ($P_9$) were crossed in the all possible combinations, excluding reciprocals, during summer,

2010 to get 36 $F_1$ seeds for the study on heterosis, combining ability, gene action, heritability (narrow sense) and genetic advance for 13 fruit yield and yield attributing traits. Observations were recorded on 13 characters *viz.* node number to first staminate and pistillate flower anthesis, days to first staminate and pistillate flower opening, days to first fruit harvest, number of primary branches per plant, node number of first fruits set, vine length (m), fruit length (cm), fruit diameter (cm), number of fruits per plant, Average fruit weight (g), yield per plant (kg).

**Results and Discussions**

The coefficient of genotypic and phenotypic variability is helpful to measure the extent of variability in a particular trait. They also help to measure the variability present among various quantitative traits. The estimates of coefficient of phenotypic coefficient of variation revealed that magnitude of phenotypic coefficient of variation for all the characters were higher than the magnitude of genotypic coefficient variation during 2011 and 2012. High estimate of genotypic as well as phenotypic coefficients of variability were observed for number of fruit per plant and fruit yield per plant during 2011 and 2012. The phenotypic coefficients of variability were only higher for number of fruit per plant during 2011. Moderate variability showed in fruit yield per plant Rest of characters showed low coefficient of variability.

**Estimates of heritability in narrow sense**

Estimates of $h^2$ (ns) have been classified by Robinson (1966) into three categories *viz.*, high (> 30%), medium (10-30%) and low (< 10%). During year 2011 the high narrow sense heritability estimate in was recorded for days to first fruit harvest (33.30%), node number of first fruit set (33.20%) and moderate narrow sense heritability estimate was recorded for vine length (29.80%), fruit length (26.70%), number of fruits per plant (26.40%), days to anthesis of first pistillate flower (25.90%), fruit diameter (20.50%), days to anthesis of first staminate flower (18.80%), fruit weight (18.20%), fruit yield per plant (12.80) and low narrow sense heritability estimate was recorded for rest of the traits. During year 2012 the high narrow sense heritability estimate was recorded for fruit length (38.80%) only, and moderate narrow sense heritability estimate was recorded for vine length (29.10%), node number to first fruit set (25.60%), number of fruit per plant (24.20%), fruit diameter (23.30%), fruit weight (22.70%), days to anthesis of first pistillate flower (19.80%), days to anthesis of first staminate flower (16.90%), fruit yield per plant (13.70%), days to first fruit harvest (11.60%) and low narrow sense heritability estimate was recorded in rest of the characters.

Expected genetic advance, expressed as per cent of mean ranged from 1.57 to 16.95 per cent during 2011 whereas 1.70 to 18.01 during 2012. During 2011 the highest value of expected genetic advance was observed for only one character *viz*; fruit yield per plant (16.95%). Moderate to low expected genetic advance were observed for number of fruits per plant (8.67%), fruit diameter (7.90%), node number of first fruit set (6.24%), node number to anthesis of first staminate flower (5.65%), fruit weight (4.46%), days to anthesis of first staminate (3.66%), days to anthesis of first pistillate flower (3.38%), node number to anthesis of first pistillate flower (3.15%), fruit length (2.69%), primary branches per plant (2.81%), days to first fruit harvest (2.52%), vine length (1.57%).

During 2012 highest value of expected genetic advance was observed for fruit yield per plant (18.01%). Moderate to low genetic advance were observed for number of fruit per plant (9.49%), node number of first fruit set (7.70%), fruit diameter (6.89%), node number to anthesis of first pistillate flower (5.34%), number of primary branches per plant (4.73%), node number to anthesis of first staminate flower (4.49%), days to first fruit harvest (3.87%), days to anthesis of first pistillate flower (3.46%), days to anthesis of first pistillate flower (3.23%), average fruit weight (2.88%), vine length (1.70%) and fruit length (1.21%).

**Table 1:** Estimates of mean, range, coefficient of variation, heritability and genetic advance in bitter gourd over two years (2011 and 2012)

| Characters | Years | Grand mean | Range of mean values | | Coefficient of variation | | Heritability in narrow sense (%) | Genetic advance in per cent of mean |
|---|---|---|---|---|---|---|---|---|
| | | | Parents | Crosses | PCV | GCV | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Node number to anthesis of first staminate flower | $Y_1$ | 8.65 | 7.47 to 8.40 | 7.46 to 9.30 | 5.77 | 3.53 | 7.00 | 5.65 |
| | $Y_2$ | 8.20 | 7.53 to 8.36 | 7.53 to 8.86 | 4.75 | 2.84 | 8.70 | 4.49 |
| Node number to anthesis of first pistillate flower | $Y_1$ | 11.45 | 10.63 to 11.63 | 10.46 to 12.40 | 5.69 | 2.61 | 7.10 | 3.15 |
| | $Y_2$ | 10.94 | 10.20 to 11.23 | 9.88 to 11.80 | 4.72 | 3.09 | 8.60 | 5.34 |
| Days to anthesis of first staminate flower | $Y_1$ | 33.56 | 31.70 to 33.53 | 31.70 to 35.50 | 3.13 | 2.09 | 18.80 | 3.66 |
| | $Y_2$ | 34.23 | 34.16 to 36.21 | 32.36 to 36.21 | 3.47 | 2.13 | 16.90 | 3.46 |
| Days to anthesis of first pistillate flower | $Y_1$ | 38.98 | 36.83 to 39.40 | 36.30 to 41.70 | 5.84 | 2.74 | 25.90 | 3.38 |
| | $Y_2$ | 37.03 | 35.16 to 38.30 | 35.16 t0 38.73 | 2.67 | 1.81 | 19.80 | 3.23 |
| Days to first fruit harvest | $Y_1$ | 48.10 | 45.63 to 48.56 | 45.13 to 52.16 | 4.97 | 2.18 | 33.30 | 2.52 |
| | $Y_2$ | 48.67 | 44.80 to 50.68 | 44.65 to 51.10 | 4.67 | 2.62 | 11.60 | 3.87 |
| Number of Primary branches/ plant | $Y_1$ | 18.68 | 18.00 t0 18.94 | 17.89 to 20.50 | 3.41 | 1.91 | 5.00 | 2.81 |
| | $Y_2$ | 17.52 | 16.76 to 18.03 | 16.31 to 18.53 | 3.72 | 2.58 | 7.80 | 4.73 |
| Node number of first fruit set | Y1 | 14.49 | 13.68 to16.13 | 13.68 to 16.13 | 5.33 | 3.55 | 33.20 | 6.24 |
| | Y2 | 15.81 | 14.40 to17.05 | 14.10 to 17.91 | 6.59 | 4.39 | 25.60 | 7.70 |
| Vine length (m) | Y1 | 1.74 | 1.70 to 1.74 | 1.69 to 1.82 | 2.46 | 1.21 | 29.80 | 1.57 |
| | Y2 | 1.72 | 1.70 to 1.74 | 1.69 to 1.76 | 1.40 | 0.61 | 29.10 | 1.70 |
| Fruit length (cm) | Y1 | 11.20 | 10.80 to 11.34 | 10.66 to 11.68 | 1.83 | 1.37 | 26.70 | 2.69 |
| | Y2 | 11.18 | 11.14 to 11.29 | 10.75 to 11.45 | 1.70 | 0.88 | 38.80 | 1.21 |
| Fruit diameter (cm) | Y1 | 3.36 | 3.17 to 3.47 | 3.09 to 3.87 | 5.63 | 4.11 | 21.50 | 7.90 |
| | Y2 | 3.29 | 3.12 to 3.23 | 3.12 to 3.58 | 4.36 | 3.37 | 23.30 | 6.89 |
| Number of Fruits/ plant | Y1 | 17.83 | 15.86 to 18.86 | 13.76 to 19.76 | 10.18 | 5.78 | 26.40 | 8.67 |
| | Y2 | 16.80 | 14.90 to 18.06 | 14.88 to 18.91 | 7.81 | 5.30 | 24.20 | 9.49 |
| Average fruit weight (g) | Y1 | 71.93 | 66.40 to 70.50 | 66.40 to 76.53 | 4.31 | 2.70 | 18.20 | 4.46 |
| | Y2 | 70.92 | 68.50 to 74.50 | 66.46 to 74.91 | 3.02 | 1.82 | 22.70 | 2.88 |
| Fruits yield/ plant (kg) | Y1 | 0.91 | 0.69 to 1.00 | 0.69 to 1.04 | 9.17 | 7.68 | 12.80 | 16.95 |
| | Y2 | 0.92 | 0.92 to 0.96 | 0.88 to 0.96 | 3.03 | 1.52 | 13.70 | 18.01 |

**References**


1. Rai M, Pandey AK. Towards a rainbow revolution. The Hindu Survey of Indian Agriculture. 2007, 112-119.
2. Singh K. Transformation of Vegetable Science in India-Looking Back and Ahead. Financing Agriculture. 2004, 15-28.
3. Maharana K, Tripathy P, Tripathy KK, Maharana T, *et al*. Genetic variability and heritability studies in spine gourd. Current Research. 1995; 24(7):122-124.
4. Khanikar S, Chakrabarty BK, Barua PK, *et al.* Patterns of genetic variability in ridge gourd. Proceedings of the Seminar on Problems and Prospects of Agricultural Research and Development in North-East India, Assam Agricultural University. 1995, 74-77.
5. Rajput JC, Paranjape SP, Jamadagni HM, *et al.* Variability, heritability and scope of improvement for yield components in hitter gourd. Annals of Agricultural Research. 1996; 17(1):90-93.
6. Mishra HN, Mishra RS, Parhi G, Mishra SN, *et al.* Diallel analysis for variability in bitter gourd. Indian Journal of Agricultural Science. 1998; 68(1):18-20.
7. Hawlader MSH, Haqu, MM, Islam MS, *et al*. Variability correlation and path analysis in bottle gourd. *Bangladesh* Journal of Scientific and Industrial Research. 1999; 34(1):50-54.
8. Thakur JC, Khattra AS, Brar KS, *et al.* Genetic variability and heritability for quantitative traits and fruit fly infestation in bitter gourd. Journal of Research, PAU. 1994; 31(2):161-166.